ST8050

Installer Guide

ST8050UG003

ST8050
Installer Guide

Revision 3.00

6/23/2014

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2 Revision

Revision	Date	Author	Description of change
1.00	02/12/02012	Ramiro Sanchez	Initial Revision
2.00	04/16/2013	Carla Jones	Marketing Review
3.00	10/21/2013	Ramiro Sanchez	Modify figure (Ignition sense) Add new figure for panic button

Introduction

There are four primary components to installing the ST8050 vehicle tracking device:

- Power connections
- Antenna installations
- IO connection, and
- Mechanical mounting of the device.

This Installation Guide offers step-by-step instructions to ensure a successful installation of the device. This document is a supplement intended to help installers with more difficult or non-standard installations. It will also help with the testing and troubleshooting of installations that don't initially work properly and will help installers be more proficient and faster when managing multiple installations.

The device's power wiring harness must be connected to the vehicle's electrical system at three points, power, ground, and ignition source. Each of these three wires must be connected to an appropriate connection point in the vehicle. Finding and determining the suitability of the appropriate connection point for each wire is described in detail in subsequent sections of this document.

In order to perform the steps outlined below it will be necessary to use a good quality multi-meter. DC voltage up to 36 volts and resistance down to less than one ohm will need to be accurately measured.

When working with vehicle wiring, be very careful that no bear wires and or tools that come in contact with a wire ever makes contact with a ground (the vehicle's chassis). This may result in a blown fuse, and could also cause excessive heat or fire. It is always preferable to disconnect the vehicle's battery before doing any work on the vehicle's electrical system.

Be aware, if you decide to disconnect the battery and the vehicle has an anti-theft-coded radio or is equipped with an airbag, a warning light to be displayed which may require a trip to the dealer to be corrected.

Mounting the Device

Mounting the device itself is a critical part of the installation that is often mistakenly considered less significant than other aspects. It is very important to determine an appropriate location for the device and to affix it securely in place. Most of the time, it is recommended to review the location with the owner of the vehicle prior installation.

Determining the best installation site is based on several factors – adequate space, the availability of the power connections, routing of the antenna cables and secure mounting points that are insulated from excessive vibration.

Preferable installation locations for many vehicles are under the dashboard, under a seat, in the trunk, or inside a console. The beacon is meant to be installed inside the passenger compartment of a vehicle, **not** in the motor compartment. In some trucks or vans it is possible to mount the unit on a sidewall, firewall, or internal wall.

Orientation of the beacon is not critical to its performance. In some instances visibility is desirable and in others it is not.

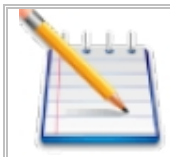
The device should be placed where the power wiring and antenna cables can be routed properly, without getting in the way of normal vehicle operations. This means leaving some room behind the device so that the connectors are accessible.

Attaching the device to the vehicle can be a challenge, especially if it is located under the dashboard where there are no panels or clear open space. In cases like this it is usually preferable to use plastic cable ties to attach the beacon. The cable ties offer a flexible mounting system that dampens vibration yet securely affixes the device in any orientation. Cable ties can strap the device to brackets, wire bundles, or sturdy fittings of any kind. It is not necessary to use all four corner mounting holes; two or three are usually adequate. Leave the rubber spacers in the holes of the mounting flanges but remove the metal bushings to allow the cable ties to pass through the spacers. It is not necessary to cinch the cable ties completely

tight. As long as the device won't rattle or swing around it should be secure.

Tools Required

- Wire cutters / wire strippers
- Voltmeter
- Soldering Iron / Solder
- Electrical tape
- Plastic cable ties
- Screw drivers
- Wrenches/sockets



Once the device is properly installed and all connections are made, it is strongly recommended to verify with the service provider that the readings are correct for the device and the server is receiving accurate information prior to re-assembling or closing components of the vehicle.

Wire Connection Methods

Making electrical connections will usually involve connecting a wire in the wiring harness to an existing wire in the vehicle. There are several methods of making electrical connections, some of which will be discussed here in order to help the installer determine the appropriate method for each circumstance.

Twisting Method

Some installers attempt to simply strip the insulation from wires, twist them together, and insulate them with electrical tape. THIS IS NOT RECOMMENDED. Twisted wires have no consistent electrical connection and are mechanically unsound. If you must choose this method consider the following diagram tips to make the best connection possible. Fig. 1 and Fig. 2

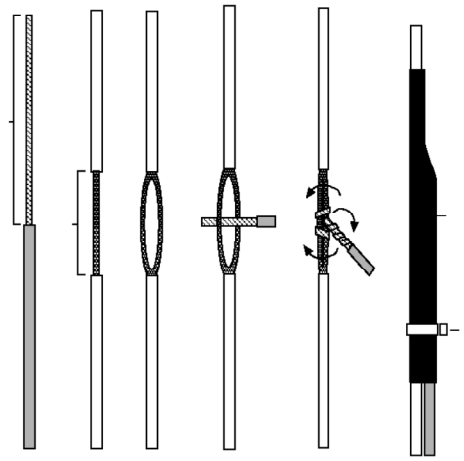


Fig. 1

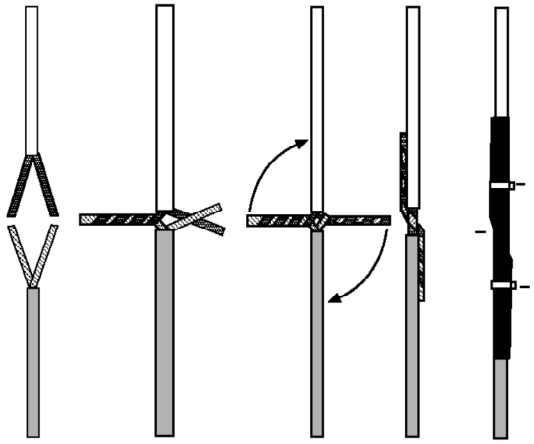


Fig. 2

Crimping Methods

Common types of automotive splicing connectors are known as Insulation Displacement Electrical (IDE) connectors. These are available from many auto parts and electrical supply stores. The connectors make contact by slicing through the insulation of the wire with sharp internal blades which then come in contact with the internal conductors. If these are incorrectly used or the wrong size is selected it is possible to cut the main wire. The benefit of crimping methods, however, are quick and easy connections that can be made with a simple hand tool. The drawback is the reliability of the connection. The slicing action punctures the wire's insulation and cuts into the internal conductors. This weakens the wire's mechanical strength, possibly reduces its current carrying capability, and exposes it to corrosion.

IDE connectors are not recommended for durable beacon installations. Fig. 3, Fig. 4, Fig. 5, Fig. 6.

Fig. 3 Fig. 4 Fig. 5 Fig. 6

Soldering Method

The recommended connection between vehicle wires and the beacon's wiring harness is a soldered connection. This is best performed by cautiously stripping a ½ inch section of insulation from the vehicles wire using a razor knife. Next, wrap the bare end of the beacon wiring harness wire several times around the exposed vehicle wire. (Fig. 1 and Fig. 2) Use a soldering iron and rosin-core solder to make the electrical connection. Be sure to get both sections of wire hot enough to melt the solder till it flows freely between the strands of wire. The connection should be held still until the solder cools and solidifies to a shiny metallic bead. After the soldering is complete, wrap at least 5 layers of electrical tape around the connection point, ensuring that the tape adheres to the wires' insulation creating a sealed layer of insulation.

Power Connection

Power for the device is supplied via the red wire on the power wiring harness. Connect this wire to the appropriate connection point in the vehicle as described below.

The ST8050 device requires a power source with a voltage between 8 and 36 volts DC, and a current capability of up to 1 Amp. Most vehicle power systems use 12 Volts DC so the appropriate voltage is relatively easy to access. More difficult is to ensure that the 1 Amp current draw can be supplied without trigging the vehicle computer sensor on most new vehicle models.

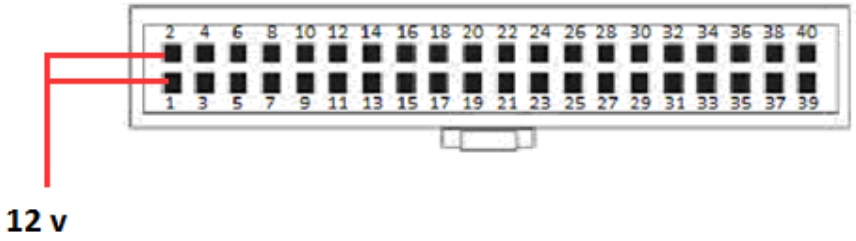
It is critical that the main power source for the device be continuously available, i.e., it is not switched off when the vehicle is off. It must remain above 12 volts and can not be tied to any other switch in the vehicle. Test to be sure that your selected power source is unaffected by switching on and off any lights, turn signals, audio system, heating system, horn, etc.

Some vehicle circuits are current limited as a result of isolating them from other vehicle systems. As an example, the circuits to power the audio systems may be isolated from other systems to reduce noise.

If the device is connected directly to the vehicles battery, it will most likely have adequate current delivery capability. If it is connected to some other circuit of the vehicle it must be tested to ensure that the maximum current is available. An adequate test would be to connect the device temporarily and ensure that it can provide tracking points to the user portal. If the temporary electrical connection fails to adequately power the device, it must be connected to another source within the vehicle; in general, the closer the connection is to the battery the better.

Good sources of power can be found at the fuse boxes or at the ignition switch. It is also possible to find adequate power sources at certain lights and at power devices like seat adjustment motors. An indication that the chosen power source can supply adequate current will be the gauge of the wire. If it is very thin, such as 18 Gauge or lighter, it is not meant to carry high enough currents to supply the existing circuit plus the extra current demands of the beacon. It is preferable to connect to the heavier power wires in the vehicle.

Connect the RED WIRES from PIN 1 AND PIN2 to the Positive side of the Power Supply.



Grounding

Grounding for the device is supplied via the black wire on the power wiring harness. Connect this wire to the appropriate connection point in the vehicle as described below.

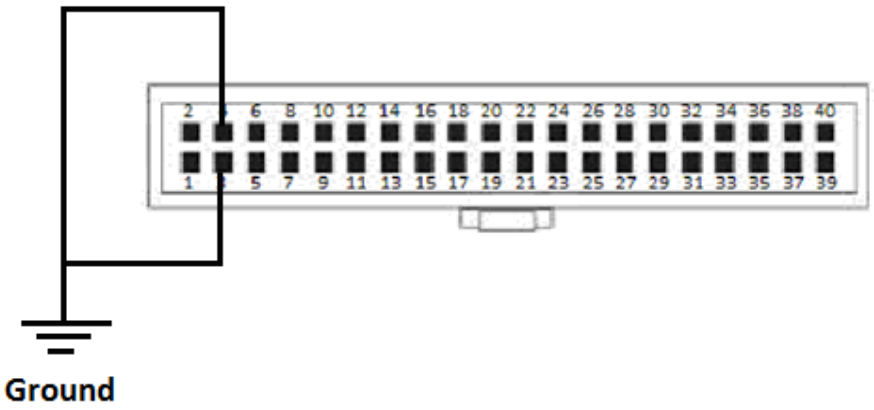
Grounding is every bit as critical as the power connection. On virtually all vehicles the chassis is grounded. If it is possible to connect the black wire of the device's power wiring harness to the vehicle's chassis this is the best connection. Be sure the connection method does not add resistance. A crimped-on ring terminal screwed to the chassis should be adequate. Make sure that the chassis connection point is not painted or coated with some other insulating material such as grease, wax, plastic, or anti-corrosion coating.

If connecting directly to the chassis is not possible, it is critical to determine the resistance between the desired connection point and the vehicle's chassis. It is not adequate to measure the voltage of a connection point to determine if it is ground. In other words, a wire that measures zero volts is not necessarily a ground wire.

A resistance of no more than 1 (one) ohm between the connection point and the vehicle chassis should be allowed. This is critical! If the resistance is any higher, the voltage differential between the power source and ground, at full current, will drop below the minimum 8 volts required to power the device.

If connecting to a ground wire rather than the vehicle's chassis, be sure the ground wire is a heavy gauge so it can carry the full maximum current of the device. Do not connect to thin wires of 18 Gauge or lighter. Connect only to the heavier ground wires of the vehicle. Remember, the full supply current of up to 3 Amps will also flow to ground. Heavy ground wires can be found at the fuse boxes, ignition switch, and some of the lights and motors in a vehicle.

Connect the BLACK WIRES from PIN3 and PIN4 to the Ground or Negative of the Power Supply



Ignition Sense

The important factors for the ignition sense connection are considerably different from those of the power and ground connection. The ignition sense connection does not draw much current, but it is more than simply a voltage that is switched ON and OFF with the ignition.

It is important to understand that if the device's ignition sense wire is not connected, the features of the device will be limited and the reports won't reflect all activities and relevant information such as a trip report.

All digital inputs support a maximum 3.5 volts. When it is not possible to connect the ignition cable directly to the vehicle, to allow the connection of the ignition sense to default to the ON state; an external relay must be used.

As a result, the ideal ignition sense connection point is where 12 volts appears when the vehicle's ignition is ON and a low resistance to ground appears when the vehicle's ignition is OFF.

Remember that a zero volt reading is not necessarily indicative of a ground source. If a connection point rises to 12 volts when the ignition is ON but merely disconnects when the ignition is OFF, it will not trigger the device's ignition sense. It will be the equivalent of leaving the ignition sense disconnected, which the device will read as ignition ON.

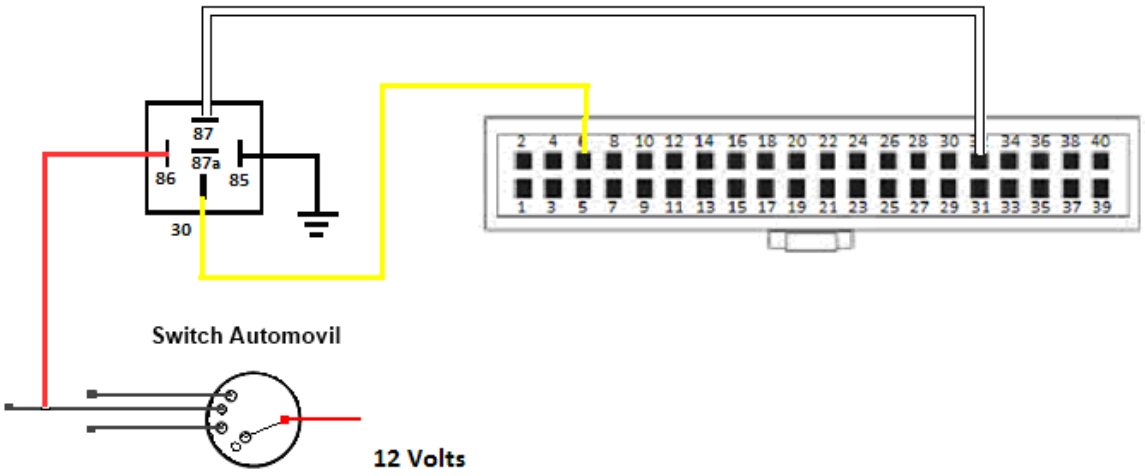
Making the measurements to select the right ignition sense connection point is very particular. Two different parameters must be measured and they can not be measured with the same settings of the multi-meter.

The first parameter to measure is voltage. The voltage of the ignition sense connection point must switch between 0 and 12 volts with the ignition (0 volts with ignition OFF, 12 volts with ignition ON). The second parameter to measure is the resistance to ground with the ignition OFF.

Do not attempt to measure the resistance to ground of the ignition sense connection point when voltage is present, i.e. when the ignition is ON. This could damage your multi-meter

After first ensuring that the voltage at the connection point is zero with the ignition off, measure the resistance to ground. It must be below 50 ohms, preferably below 10 ohms.

Ignition sense connection points can typically be found at the ignition switch, at the fuse box, or at certain vehicle systems that are switched on with the ignition. Examples are seat-belt detection systems, audio systems, heating systems, and some lights.

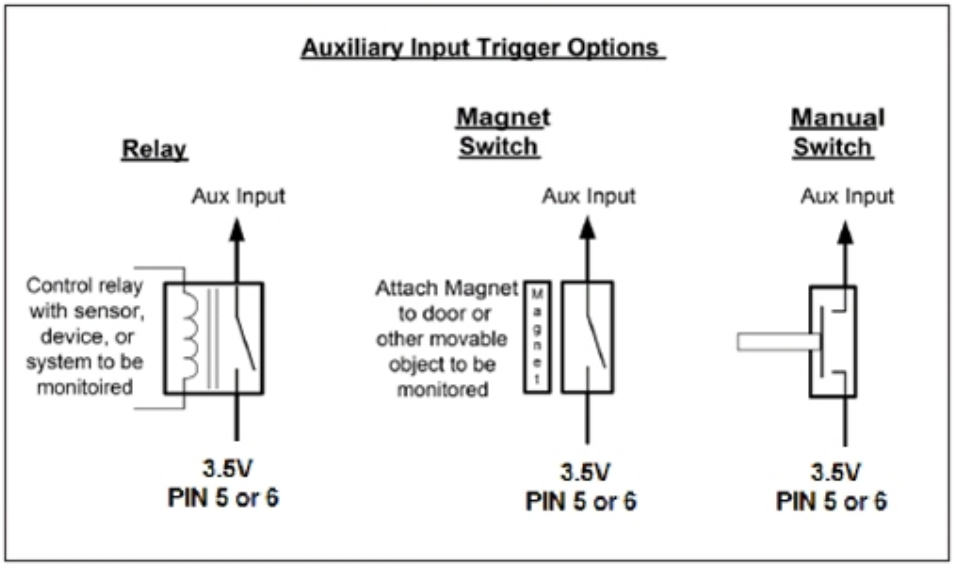


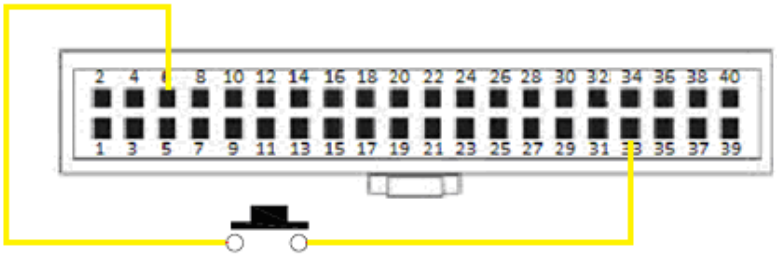
Switch Automovil

12 Volts

Install Auxiliary Input Sense (Panic Optional)

The auxiliary input will sense a voltage change between low (0 Volts) and high (3.5V). This is achieved by installing a switch between the digital input sense on the I/O wiring harness and the 3.5 volts source (Pin 5 or 6). When the switch is closed (3.5 Volts) the device will sense the state change and record the event. Similarly, when the switch is opened, the device will sense the opposite state change and record the event.





Installing Antennas

There are three antennas to install for the ST8050 device; the GPS antenna, the cellular (GSM) antenna and the Iridium antenna. Each antenna has a different size and form.

All three antennas have either internal magnets or an adhesive side, so it is possible to affix them in position by placing them on an appropriate steel bracket or a clean surface. If no steel bracket is available, the antennas can be mounted with adhesive, tape, or plastic cable ties. It may not be necessary to affix the antennas at all if they are located in areas where friction will hold them in place without vibrating, rattling, or slipping.

Positioning and orientation is critical for the GPS antenna and the Iridium antenna but neither is particularly critical for the GSM antenna. It is best not to place the three antennas in exactly the same location because it's possible for one signal to interfere with another. Try to keep them at least 18 inches apart.

GSM Antenna

For the GSM antenna, it is preferable to mount it in a vertical orientation. Any orientation will likely be adequate. It is important that it be located in an area that is not completely surrounded by metal. A metal base is actually desirable, both for magnet mounting and as a ground plane for the signal. A few metal brackets or plates in the vicinity of the GSM antenna should not present a problem.

It is better to install the GSM antenna inside the passenger compartment of the vehicle than in the engine compartment. The engine compartment is usually surrounded by metal and exposes the antenna to excessive heat, vibration, and moisture. In the trunk of a car should be adequate. Good locations for the GSM antenna are under the dashboard or under a seat. If installing under a seat, ensure that the antenna does not interfere with full movement of the seat. The back wall or side wall of a van or truck cab are also reasonable locations.

The panel-mount connector for the GSM antenna is held in place only by friction.Be careful during the installation process so that it is not placed where it can be disconnected by vibration, rattling, or slipping.

GPS Antenna

GPS signals are much weaker than GSM signals. For this reason the GPS antenna used with the ST8050 is what is known as a directional antenna. It amplifies signals from one direction while attenuating signals from other directions. The signals that need to be amplified come from the GPS satellites, which may be located anywhere from straight up to just above the horizon. The rounded top of the GPS antenna is the direction in which it amplifies received signals. The flat bottom is where the magnet mount is located.

It is usually desirable to orient the GPS antenna straight up, but there are exceptions. If metal in the vehicle is blocking one or more directions, it is not useful to amplify signals from that direction. As an example, if the cab of a truck is all metal with the exception of the front and side windows, it is preferable to aim the antenna out the window, not straight up at the roof of the cab.

It is useful to understand which materials block signals and which do not. A simple rule of thumb is that materials that conduct electricity will block signals and materials that do not conduct electricity will not block signals. The thickness of the material is much less of a factor than the conductivity of it. For instance, a thin film of aluminum foil will block signals almost completely while a thick human body will only partially block signals. The reason is that the aluminum is an excellent conductor of electricity while the body is a poor conductor.

Another grey area is where the conductor is not a continuous plane but a mesh, such as the metal springs in a vehicle seat. The rule of thumb here is that higher frequencies penetrate smaller mesh. GPS signals are a fairly high frequency so they will penetrate any conductive mesh with holes greater than about 6 inches across. This is important for places like a car trunk where the majority of the signal is entering through the back seat and the rear window of the car and down through the package shelf behind the back seat. Both the seat itself and the bracing for the package shelf typically contain metal mesh components. Some, but not all, of the GPS signal will be blocked from the trunk space.

Metals of any kind will block signals, however small metal brackets or fittings above the GPS antenna are generally not a problem as long as they do not block a large percentage of the direction of signal reception. The following types of materials, generally found in vehicle construction, do not block signals: plastic, glass, fabric, vinyl, leather, rubber, Styrofoam.

The best location for placing the GPS antenna in a vehicle is on top of the dashboard, directly below the center of the front windshield. To improve the esthetics of the installation it is usually preferable to hide the antenna. Placing it directly under the dashboard, up near the windshield, can accomplish both excellent signal reception and a hidden installation. Be sure that there is no metal between the antenna and the windshield. In most vehicles there are metal brackets in various locations throughout the bottom and middle of the dashboard but up near the top they are usually absent. In some vehicles there are even cavities in the top of the dashboard accessible through removable plastic panels. These are ideal GPS antenna installation sites.

Another possible GPS antenna installation site in a car is directly under the package shelf behind the back. In a truck or van the antenna must have visibility through the front windshield. Sometimes a console between the seats offers a reasonable antenna location. However, it must be a location where metallic objects will not be placed on top of the compartment. Items like thermal coffee containers and metal clip boards have been know to interfere with beacon performance.

Iridium Antenna

Antenna installation is critical for optimum performance of your Iridium service. Your antenna is your connection to the satellites and it needs as clear a line of sight to the horizon as possible. Every effort should be made to achieve maximum visibility at all times.When installing antenna cables, follow these guidelines:

- Route and restrain cables to prevent them from vibrating or moving under normal conditions, which could result in damage to the antenna or the coaxial cable connections.

- Wherever the cables contact structures, protect the cables from chafing or abrasion. If a cable needs to be bent, avoid kinking it, and ensure that each bend radius follows.

- Use coaxial sealant, shrink-wrap tubing, electrical tape, or another suitable product to seal all cable connections appropriately to prevent moisture and corrosion damage from weather exposure.

- Connectors should be tightened as shown below in the absence of manufacturer advice specific to your cable:

    - *Tighten Type N connectors to a torque of 0.68 to 1.13 N-m (6 to 10 inch-lbs).*
    - *Tighten Type TNC connectors to a torque of 0.45 to 0.68 N-m (4 to 6 inch-lbs).*

- Use only cables supplied by Skypatrol for the Iridium network.

- Mount all antennas vertically and clear of nearby metal obstructions.

- Minimize horizontal obstructions as much as possible as they can create areas of poor system coverage.

- To minimize the loss of radio signal from the antenna to the terminal, the specific coaxial cable system between the antenna and the other component should be less than 3db including connector loss.

Iridium is committed to providing subscribers around the world consistent, reliable, quality voice and data access all day, every day. The Iridium satellite system is monitored for performance from numerous locations 24 hours a day, 7 days a week in order to achieve this.

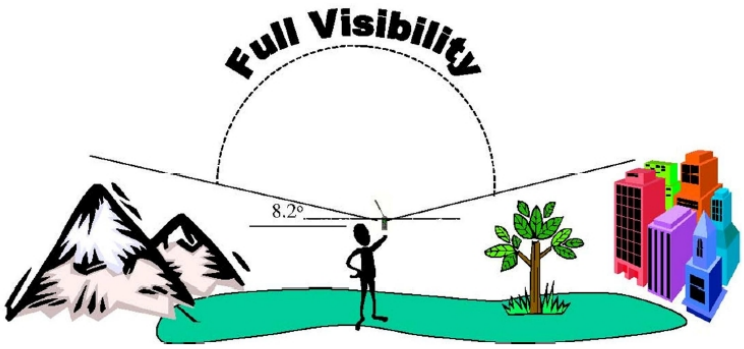
There are conditions that can compromise the quality of the service you may receive. These include:

- Obstructions
- Cabling
- RF Interference

1. Obstructions

The antenna must be able to “see” the entire sky from approximately 8 degrees above the horizon. Nearby tall buildings or similar structures, heavily leafed trees and mountains can all degrade performance as they block the signal between the antenna and the satellites. Having a completely open view of the sky plays a very important role in maximizing performance, as the Iridium satellites cross the sky from North horizon to South horizon.

All surrounding obstructions must be lower than the top of a fist extended at arms length and the bottom of the fist placed on the horizon. Iridium performance is immune to natural environmental occurrences such as clouds, fog, rain, snow, wind and smoke.



2. Cabling

Using an externally mounted antenna provides an ideal solution for many applications. If you have or plan to install an external antenna, it is very important that the cables used meet the Iridium guidelines established for proper performance.

For optimal performance, we recommend using the shortest length of cable and the fewest number of connectors possible.

3. RF Interference

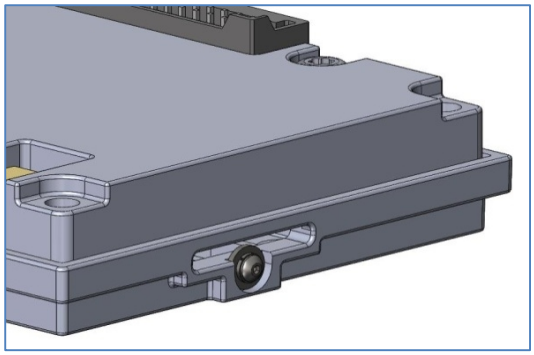
All wireless devices, including satellite telephones, are susceptible to RF (Radio Frequency) interference from other electronic devices. This problem is more evident when numerous antennas and broadcasting devices are located within close proximity to each other.

The location of the INMARSAT antenna in relation to the Iridium antenna plays a significant role in determining the degree of signal degradation that an Iridium subscriber can expect to experience. Given the inherent system differences (LEO versus GEO), all Iridium units are susceptible to this interference, regardless of the type of antenna being used.

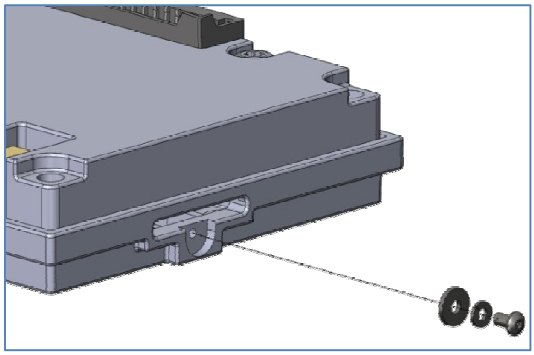
Other sources of RF interference such as Globalstar units, radar devices and broadcast stations can provide interference for Iridium units, but usually are not encountered as frequently as INMARSAT terminals.

SIM Installation

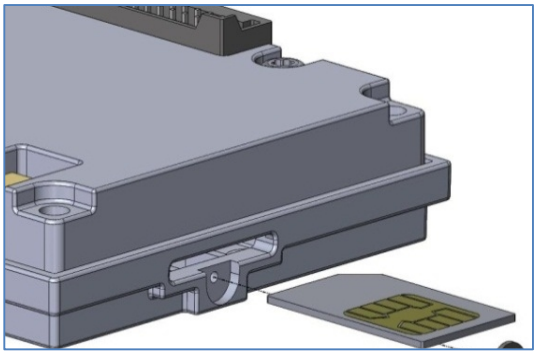
One of two types of screws are used to attach the SIM card to the modem. The screw will be a round head screw, Phillips, 0-80 X 3/16, SS, or a hex screw, size 0-80, 50th.



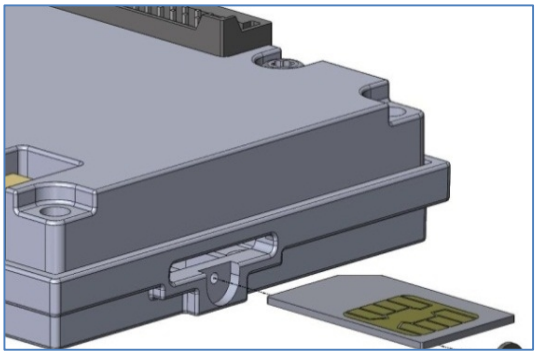
1. Find side of case with screw and washers.



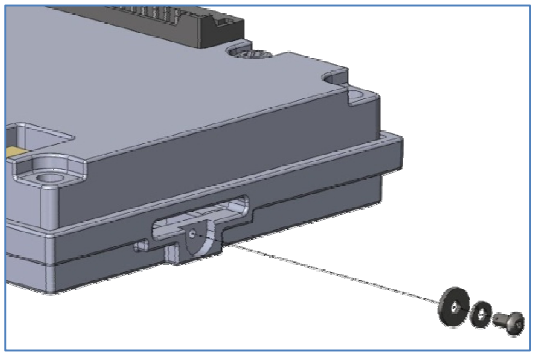
2. Remove screw and washers from side of case



3. Insert SIM card with the metal contacts facing upward.



4. Ensure SIM card clicks into place.



5. Replace the washers and screw.

Appendix A – Iridium Antenna – Proper installation

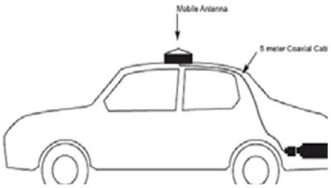
The antenna system is suitable for marine, vehicle and fixed applications and designed to meet Iridium System performance requirements when installed according to the instructions in this guide.

The following figure shows typical Installations:

Preferred Antenna Location

Vehicle Antenna Installation

The ideal position for any vehicle-mounted application is to capitalize on the greatest ground plane from the surface of the vehicle.



Marine Antenna Installation

The antenna must be installed without obstruction of other instruments or structures.

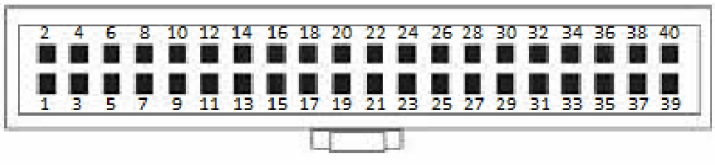
The antenna must not be positioned within range of radar equipment or other RF interference.

Appendix B – ST8050 Connector Description

The ST8050 connector has 40 pins connector. Each pin has the following function:

Pin	Signal	Type	Voltage (Min/Max/ Nominal) VDC	Notes
1	**UBATT (+)**	Power	6/32/12	
2	**UBATT (+)**	Power	6/32/12	
3	**UBATT (-)**	Ground		
4	**UBATT (-)**	Ground		
5	**3V5_500MA**	Continuous Output	+/- 1%@650mA	Used to pull the digital input port signal to high
6	**3V5_500MA**	Continuous Output	+/- 1%@650mA	Used to pull the digital input port signal to high
7	**NOT USED**			
8	**NOT USED**			
9	**NOT USED**			
10	**NOT USED**			
11	**GND**	Ground		
12	**NOT USED**			
13	**MTS_RXD_RS232**	Output		Serial Port RX
14	**NOT USED**			
15	**MTS_TXD_RS232**	Input		Serial Port TX
16	**MTS_DSR_RS232**	Output		Serial Port DSR
17	**MTS_DTR_RS232**	Input	6/32	Serial Port DTR
18	**MTS_DCD_RS232**	Output		Serial Port DCD
19	**GND**	Ground		
20	**LOG_TXD_RS232**	Input		
21	**GND**	Ground		
22	**LOG_RXD_RS232**	Output		
23	**CANH**	Input/Output		CAN High signal
24	**CANL**	Input/Output		CAN Low signal
25	**SW_UBATT_0**	Output	UBATT(+)/1A@25C	Switched Relay
26	**SW_GND_0**	Output	GND/1A@25C	Switched Relay
27	**SW_UBATT_1**	Output	UBATT(+)/1A@25C	Switched Relay
28	**SW_GND_1**	Output	GND/1A@25C	Switched Relay
29	**ANA1**	Input	0-3.5	Analog port 1
30	**GND**	Ground		

31	**ANA2**	Input	0-3.5	Analog port 2
32	**DIG_1**	Input	3.5V CMOS/TTL	Used to monitor the vehicle ignition state
33	**DIG_2**	Input	3.5V CMOS/TTL	Used to monitor the SOS button
34	**DIG_3**	Input	3.5V CMOS/TTL	
35	**DIG_4**	Input	3.5V CMOS/TTL	
36	**DIG_5**	Input	3.5V CMOS/TTL	
37	**DIG_6**	Input	3.5V CMOS/TTL	
38	**DIG_7**	Input	3.5V CMOS/TTL	
39	**DIG_8**	Input	3.5V CMOS/TTL	
40	**GND**	Ground		



Appendix C – ST8050 Dimensions